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DEVONIAN FAUNAS IN PENNSYLVANIA

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By Bradford Willard

INTRODUCTION

It is the purpose of this bulletin to list certain Middle and Upper Devonian faunas in Pennsylvania. The report is preliminary work. Little attempt is made to interpret, beyond general statements, the Devonian stratigraphy. Such interpretative conclusions as may be suggested regarding the interrelations of the several areas and their faunas are tentative.

For a century geological studies have progressed in Pennsylvania. The work has been dominantly economic, although the Second Pennsylvania Geological Survey devoted much space to stratigraphy. Paleontology has been neglected or inaccurately applied. Of this situation Prosser[1] wrote: "* * * with the exception of the fossil plants of the Carboniferous, the paleontology of the State has never received the attention it deserves. This failure to give paleontology its due consideration is evident in the correlations of the local formations of the Paleozoic rocks of the State with the typical sections of those formations in New York." This statement is almost as true today as it was when made over a generation ago. The State Surveys of Maryland, New Jersey, New York, and Ohio have given paleontology large consideration so that we have accurate knowledge of their Paleozoic faunas. This is particularly true of the Devonian. In the study of these remains from Pennsylvania James Hall's multivolumed "Palaeontology of New York" and the Maryland Geological Survey report on the Devonian of that State have been invaluable. The Second Pennsylvania Geological Survey listed many Devonian fossils, often dubiously or altogether incorrectly identified. Most of this work appears to be attributable to I. C. White and E. W. Claypole. Since the time of the discontinuance of the Second Survey, a few papers have been printed, which, though short, are accurate accounts of some of the Devonian faunas in Pennsylvania. Certain of these touch on the areas described in this bulletin.

Through the studies of Reeside[2] and of Swartz[3], a very considerable Helderberg fauna has been identified. Kindle[4] discussed the Onondaga faunas of the State, and Williams and Kindle[5], have given us a valuable report on Middle and Upper Devonian fossils in central and north-central Pennsylvania. A very useful bulletin is Prosser's

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[1] Prosser, C. S., The Devonian system of eastern Pennsylvania and New York: U. S. Geol. Survey, Bull. 120, p. 70. 1894.

[2] Reeside, J. B., The Helderberg limestone of Central Pennsylvania: U. S. Geol. Survey, Prof. Paper 108K, 1918.

[3] Swartz, F. McK., The Helderberg group from Central Pennsylvania to southwestern Virginia: Penna. State Col., Bull. 4, pp. 1-27, 1929. (Also published in Penna. Acad. of Sci., Proc., vol. 111, pp. 75-89, 1929.)

Swartz, F. McK., Revision of the Ostracoda family Thlipsuridiae, with descriptions of new species from the Lower Devonian of Pennsylvania: Jour. of Paleontology, vol. VI, no. 1, pp. 36-58, 1932.

[4] Kindle, E. M., The Onondaga fauna of the Allegheny region: U. S. Geol. Survey, Bull. 508, 1912.

[5] Williams, H. S., and Kindle, E. M., Contributions to Devonian paleontology: U. S. Geol. Survey, Bull. 244, 1905.

"Devonian system of eastern Pennsylvania and New York,"[6] in which he listed very fully some of our eastern faunas. It is most regrettable that he was not permitted to complete this work, since the published information is so accurate and important. Work done by the same author in northeastern Ohio[7] extended sufficiently far into northwestern Pennsylvania to be applicable. The writings so far cited deal primarily with invertebrates. Of the Devonian fishes of Pennsylvania, the best information appears to be that recorded by Newberry[8] and by Eastman[9]. Almost nothing is available on our Devonian plants although pioneer studies were begun by Lesquereux.[10] Because of this lack of information, it is purposed, first to list Middle and Upper Devonian faunas from various localities in Pennsylvania;[11] and, second to draw tentative comparisons between faunas from different localities. For convenience, the regions from which fossils have been listed will be designated as four districts:

FIRST DISTRICT. *Susquehanna and Juniata valleys near their confluence.* This region includes a little of western Dauphin County and much of the eastern half of Perry County.

SECOND DISTRICT. *Region of the Forks of the Susquehanna.* This area embraces a few localities in Columbia and Northumberland counties.

THIRD DISTRICT. *North-central Pennsylvania.* Here are included primarily Tioga and Bradford counties, but sufficient material has been collected from Potter, Cameron, and Susquehanna counties to add lists of fossils from these places.

FOURTH DISTRICT. *Upper Delaware Valley.* This region lies in Pike and Monroe counties chiefly along the lower parts of tributary valleys to the Delaware. Additional data were secured in the neighborhood of Port Jervis, New York.

FIRST DISTRICT

Susquehanna and Juniata valleys near their confluence.

Locality 1. Dauphin County, quarries at Rockville. Here is exposed massive, coarse, heavy-bedded, whitish Hamilton sandstone; lithologically strikingly like the Oriskany of this region from which it is often distinguishable only by its fossils. It contains the following species:

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[6] Ibid.

[7] Prosser, C. S., The Devonian and Mississippian formations of northeastern Ohio: Ohio Geol. Survey, 4th ser., Bull. 15, 1912.

[8] Newberry, J. S., The Paleozoic fishes of North America: U. S. Geol. Survey, Monograph XVI, 1889.

[9] Eastman, C. R., Devonian fishes of the New York formations: N. Y. State Mus., Memoir 10, 1907.

[10] Lesquereux, L., Geology of Pennsylvania (1st Survey), 1858.

[11] In a few instances, lists of Oriskany species have been supplied, but no effort has been made systematically to study this fauna.

Faunule 1

Spirophyton sp.
Crinoidea, indet.

Fenestella sp.

Stropheodonta perplana (Conrad)
Newberria sp. nov.
Camarotoechia prolifica Hall
C. congregata (Conrad)
Tropidolpetus carinatus (Conrad)
Atrypa reticularis (Linneus)
Spirifer audaculus (Conrad)
S. angustus Hall
S. granulosus (Conrad)
S. mucronatus (Conrad)
S. cf. tullius Hall
Athyris spiriferoides (Eaton)

Pterinia flabellum (Conrad)
Aviculopecten princeps (Conrad)
A. faciculatus Hall

Pleurotomaria (Bembexia) sulcomarginata (Conrad)

Orthoceras sp.

Trilobite, indet.

Plantae, indet.

Locality 2. Dauphin County, north slope of Little Mountain at small reservoir one-fourth mile east of railroad, and half a mile north of Rockville. A soft, weak, yellow-brown shale, sometimes slightly arenaceous carries the following faunule interpreted as being of Ithaca age or possibly more closely related to the Parkhead of Maryland.

Faunule 2

Pleurodictyum sp.

Crinoidea, indet.

Polypora cf. fisulata (Hall)
Bryozoa, indet.

Lingula cf. punctata Hall
Schizobolus sp. nov.
Stropheodonta demissa (Conrad)
Chonetes coronatus (Conrad)
C. lepidiformis Clarke and Swartz
C. cf. scitulus Hall
Liorhynchus mesacostale Hall
Spirifer mucronatus var. posterus Hall and Clarke

Grammysia arcuata (Conrad)
Palaeoneilo cf. tenuistriata Hall
P. emarginata (Conrad)
Actinopteria boydi (Conrad)
Goniophora truncata Hall

Fragments of fish plates assigned to *Bothriolepis* sp. were collected from the red beds at the east edge of the Harrisburg Country Club golf course about three-fourths of a mile north of Locality 2. No distinctive fossils were found between the two places.

Locality 3. Perry County, crest of Little Mountain, west side of Susquehanna River, above quarry at west end of railroad bridge one mile south of Marysville. An Oriskany faunule occurs in coarse, light-colored sandstone faulted on top of the Hamilton:[12]

Faunule 3

Rensselaeria marylandica Hall
R. (Beachia) suessana (Hall)
Spirifer concinnoides Schuchert
S. cumberlandiae Hall

Locality 4. Perry County, abandoned quarry and railroad cuts, east end of Little Mountain west of Susquehanna River. This section includes that at Locality 1 across the river; it carries the following Hamilton fossils:

Faunule 4

Spirophyton sp.

Campophyllum sp.

Chonetes coronatus (Conrad)
Spirifer audaculus (Conrad)
S. mucronatus (Conrad)
S. granulosus (Conrad)

Plant fragments

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[12] Willard, B., Oriskany at Susquehanna Gap, Pennsylvania: Geol. Soc. America, Bull. 42, pp. 697-706, 1931.

Locality 5. Perry County, along Pennsylvania Railroad south of Marysville. A faunule was discovered in brown, somewhat sandy shale which is assigned to the Ithaca and is believed to underlie immediately the beds at Locality 2 across the river.

Faunule 5

Crinoidea, indet.

Polypora cf. fistulata (Hall)
Fenestella sp.
Bryozoa, indet.

Liorhynchus mesacostale Hall

Atrypa reticularis (Linneus)
Spirifer mucronatus var. posterus Hall and Clarke
S. mesastrialis Hall
Athyris spiriferoides (Eaton)

Actinopteria sp.

Locality 6. Perry County, Girtys Notch at Half Falls Mountain, west side Susquehanna River. The following Hamilton faunule was collected from dark, rather fissile shale with some gray, interbedded sandstone:

Faunule 6

Chonetes lepidus Hall
C. scitulus Hall
Spirifer mucronatus (Conrad)

Nucula sp.

Palaeoneilo sp.
Paracyclas lirata Conrad

Pleurotomaria (Bembexia) sulcomarginata (?) Conrad

Locality 7. Six hundred feet south of Locality 6. Sandy shale with occasional, somewhat flaggy to sub-massive sandstone lenses carries fossils thinly scattered through some 40 to 50 feet of strata. The faunule may be Portage, but is as likely upper Hamilton:

Faunule 7

Worm trails

Crinoidea, indet.

Fenestella sp.
Bryozoa, indet.

Productella cf. lachrymosa (Conrad)

Tropidoleptus carinatus (Conrad)
Atrypa reticularis (Linneus)
Cyrtina hamiltonensis Hall
Elytha (Reticularia) fimbriatus (Conrad)

Pleurotomaria (Gyroma) capillaria Conrad

Mesothyra oceani Hall and Clarke

Locality 8. Beginning about 300 yards south of Girtys Notch (Locality 6) and continuing along the highway are intermittent exposures for half a mile. The lower part consists of fairly massive, gray sandstone passing upward into chocolate-colored and finally red beds. Fossils are abundant in the lower part, but die out above, although *Spirifer disjunctus* Sowerby and occasional crinoid "joints" occur in gray beds intermingled with the red. This assemblage is interpreted as Chemung in age.

Faunule 8

Crinoidea, indet.

Trematopora cf. ornata Hall
Polypora cf. fistulata (Hall)
Unitrypa cf. scalaris Hall

Orbiculoidea sp.
Productella lachrymosa (Conrad)
Camarotoechia sp.
Atrypa reticularis (Linneus)

A. sp.
Spirifer mesacostalis Hall
S. mesastrialis Hall
S. disjunctus Sowerby
S. marcy var. superstes Clarke and Swartz

Tentaculites cf. bellulus Hall
T. descissus Clarke and Swartz

Locality 9. Perry County, Juniata Valley, east side about three miles north of the confluence of Juniata and Susquehanna rivers. Mostly red or chocolate-colored strata are exposed along the highway, but occasional, thin, green, fossiliferous shales are interbedded. Some of the chocolate and occasionally the red beds carry fossils. A Portage (Parkhead?) faunule was found here. Although Chemung fossils have been collected from still higher red beds in Perry County (see Locality 20), they were not found at this place.

Faunule 9

Stropheodonta maynardi Clarke and Swartz
Liorhynchus globuliforme (Vanuxem)
Spirifer mucronatus var. posterus (?) Hall and Clarke
S. mesacostalis Hall

Grammysia sp.

Pterinea chemungensis (Conrad)

Bellerophon clarki Clarke and Swartz
B. nactoides Clarke and Swartz
Bucanopsis maera (Conrad)
Diaphorostoma (Platystoma) lineatum (Conrad)

Locality 10. Perry County, high cut rock face along highway opposite Losh Run. Here sandstone, gray to olive-gray, weathering brown, and somewhat flaggy is interbedded with gray shale and carries an Ithaca fauna:

Faunule 10

Crinoidea, indet.

Petalotrypa cf. compressa Ulrich
Fenestella sp.
Semicoscinium sp.
Bryozoa, indet.

Chonetes lepidiformis Clarke and Swartz

Schizophoria striatula (Schlotheim)
Liorhynchus globuliforme (Vanuxem)
Cyrtina hamiltonensis Hall
Spirifer mucronatus var. posterus Hall and Clarke

Tentaculites spiculus Hall
T. descissus Clarke and Swartz

Locality 11. Perry County, three-fourths of a mile south of Half Falls Mountain[13] on the highway along the east bank of Juniata River. Interbedded gray shale and shaly, brown-weathering sandstone overlie massive Hamilton lower sandstone (seen in talus slope to north) and carry Hamilton fossils:

Faunule 11

Amplexus hamiltoniae Hall
Craspedophyllum archiaci (Billings)

Crinoidea, indet.

Fenestella sp.

Chonetes sp.

Atrypa reticularis (Linneus)
Spirifer audaculus (Conrad)
S. mucronatus (Conrad)
S. granulosus (Conrad)
Ambocoelia umbonata (Conrad)

Phacops sp.

Locality 12. Perry County, at Board Run 100 feet east of highway bridge north of Half Falls Mountain. Dark shale, sparingly fossiliferous, and believed from its stratigraphic position to be upper Hamilton is exposed in the stream bed. It carries:

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[13] Separating these beds from those at Locality 10 are sandstone underlain by dark shales provisionally assigned to the Sherburne (?) and Genesee respectively.

Faunule 12

Spirophyton sp.

Crinoidea, indet.

Bryozoa, indet.

Orbiculoidea sp.
Chonetes lepidus Hall
C. cf. vicinus (Castelnau)
C. coronatus (Conrad)
C. scitulus Hall
Rhipidomella leucosia Hall
R. sp.
Tropidoleptus carinatus (Conrad)
Spirifer mucronatus (Conrad)
S. audaculus (Conrad)
S. augustus Hall
S. sp.

Grammysia arcuata (Conrad)
Nucula bellistriata (Conrad)
Pterinopecten undosus Hall
Modiomorpha concentrica (Conrad)
Orthonota undulata Conrad

Pleurotomaria (Bembexia) cf. sulcomarginata Conrad
P. (Gyroma) capillaria Conrad
Bellerophon (Bucanopsis) leda Hall

Orthoceras sp.
Bactrites sp.

Homolonotus dekayi (Green)
Phacops cf. rana (Green)

Plantae, indet.

Half Falls Mountain is the axis of an anticline. In the core of the mountain the Helderberg limestone is exposed, overlain successively by the Oriskany (divisible here into Shriver "chert" and Ridgely sandstone members following the Maryland usage), the Onondaga and the Marcellus. These beds are recognized by their lithology and stratigraphic succession rather than faunas, since, except for the Oriskany, they are nearly barren. North and south from Half Falls Mountain successively younger Devonian strata are encountered all the way up into the red beds.

Locality 13. Perry County, along William Penn highway north from Howe Run, on the east bank of Juniata River. The beds appear to be repeated by folding and perhaps by faulting. Scattered showings occur of gray to olive, shaly sandstone and some interbedded, gray shale, passing upward (to the north) into chocolate-colored beds. The following fossils suggestive of those from Localities 9 and 10 to the south and presumably of Ithaca age were collected:

Faunule 13

Coral, indet.

Crinoidea, indet.

Fenestella sp.
Bryozoa, indet.

Leptostrophia perplana var. nervosa (Hall)
Schuchertella chemungensis (Conrad)
Rhipidomella vanuxemi (Hall)

Schizophoria striatula (Schlotheim)
Liorhynchus globuliforme (Vanuxem)
Atrypa reticularis (Linneus)
Spirifer mucronatus var. posterus Hall and Clarke
S. mesacostalis Hall
S. mesastrialis (?) Hall
Athyris spiriferoides (Eaton)

Grammysia communis Hall
Palaeoneilo brevis Hall
Ectodesma birostratum Hall

Locality 14. Continuing north from Locality 13. Shaly to massive, gray to olive-gray, brown-weathering sandstones are exposed. These are presumably overlain by red beds, but are separated from them by a concealed interval of several hundred feet. The following Chemung faunule was collected:

Faunule 14

Zaphrentis chemungensis Clarke and Swartz

Crinoidea, indet.

Fenestella sp.
Bryozoa, indet.

Stropheodonta demissa (Conrad)
Leptostrophia interstrialis (Vanuxem)

Camarotoechia contracta (Hall)
Tropidoleptus carinatus (Conrad)
Spirifer cf. marcy var. superstes Clarke and Swartz
S. disjunctus Sowerby
Elytha (Reticularia) fimbriatus (Conrad)

Leptodesma lichas (?) Hall
Actinopteria sp.

Locality 15. Perry County, west side Juniata Valley, one and one-half miles east of Newport at hill known as Trimmers Rock. Exposures are plentiful along the railroad, particularly at the southwest end of the hill where abundant fossils were found in interbedded gray sandstone and shale. They are assigned provisionally to the Portage and come from approximately the same horizon as Locality 13 across the river. Lack of data due to concealment of under- and overlying beds prevents a close check on the position of this horizon.[14]

Faunule 15

Crinoidea, indet.

Fenestella sp.
Bryozoa, indet.

Stropheodonta cf. demissa (Conrad)
Productella lachrymosa (Conrad)
Productella sp.
Rhipidomella sp.
Schizophoria striatula (Schlotheim)
Schuchertella sp. nov.
Camarotoechia congregata (Conrad)
Liorhynchus cf. quadricostatum (Vanuxem)
Tropidoleptus carinatus (Conrad)
Atrypa reticularis (Linneus)
Crytina hamiltonensis Hall
Spirifer audaculus (Conrad)
S. mucronatus var. posterus (?) Hall and Clarke
S. mesacostalis Hall
Brachiopod, indet.

Nucula corbuliformis Hall
N. sp.
Nuculites cf. oblongatus Conrad
Pterinea cf. chemungensis (Conrad)
P. prora Hall
Liopteria sp.
Ectenodesma sp.
Pelecypod, indet.

Locality 16. Perry County, Little Juniata Creek Valley, along railroad, creek, and road between Kings Mill and Sulphur Springs. Here occur many scattered exposures, principally dark gray, brown-weathering sandstone and dark gray shale. The lithology, fauna, and location of these strata suggest their near equivalence to those exposed along the Juniata at Trimmers Rock (Locality 15.) The fossils found are assigned to the Ithaca, although there are elements suggestive of the Parkhead fauna of Maryland.

Faunule 16

Crinoidea, indet.

Fenestella sp.
Bryozoa, indet.

Orbiculoidea sp.
Stropheodonta maynardi Clarke and Swartz
Leptostrophia perplana var. nervosa (Hall)
Schuchertella chemungensis (Conrad)
Productella lachrymosa (Conrad)
Rhipidomella vanuxemi (Hall)
Schizophoria striatula (Schlotheim)
Camaratoechia congregata var. parkheadensis Clarke and Swartz
C. eximia (Hall)
Liorhynchus globuliforme (Vanuxem)
Tropidoleptus carinatus (Conrad)
Atrypa reticularis (Linneus)
Cyrtina hamiltoninensis Hall

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[14] In Volume F2 of the Second Pennsylvania Geological Survey on Perry County these beds were originally called Hamilton, but the revised geologic map of the county makes them Chemung, which they certainly are not.

Spirifer mucronatus var. posterus Hall and Clarke
S. mesacostalis Hall
S. mesastrialis Hall
Athyris spiriferoides (Eaton)

Palaeoneilo plana Hall

Liopteria cf. linguliformis Hall
Actinopteria epsilon Hall
A. boydi (Conrad)

Bellerophon mactoides (Clarke and Swartz
Bucanopsis macra (?) (Conrad)

Locality 17. Perry County, north slope of Hickory Ridge south of Newport. In gray, sandy shale and sandstone the following Hamilton assemblage was found:

Faunule 17

Crinoidea, indet.

Fenestella sp.
Polypora sp.
Stropheodonta perplana (Conrad)

Rhipidomella penelope Hall
Spirifer mucronatus (Conrad)
S. granulosus (Conrad)

S. tullius (?) Hall
Elytha (Reticularia) fimbriatus (Conrad)

Tentaculites sp.
Bellerophon cf. thalia Hall
B. sp.
Loxonema hamiltoniae Hall

Dalmanites boothi (Green)

Locality 18. Perry County, north of Sterretts Gap along highway at Little Mountain. Typical, coarse Oriskany sandstone carries:

Faunule 18

Rensselaeria marylandica Hall
Spirifer cumberlandiae Hall
S. concinnoidens Schuchert

Locality 19. Perry County, on highway from Sterretts Gap toward Shermansdale, north of Little Mountain. Brownish, sandy shale yielded the following Hamilton fossils:

Faunule 19

Pleurodictyum sp.

Stromatopora cf. constellata Hall

Crinoidea, indet.

Taeniopora sp.
Bryozoa, indet.

Stropheodonta concava Hall

Leptaena rhomboidalis (Wilkins)
Schuchertella variabilis (?) Prosser
Chonetes scitulus Hall
C. marylandicus Prosser
C. coronatus (Conrad)
Atrypa reticularis (Linneus)
Cyrtina hamiltonensis Hall
Spirifer mucronatus (Conrad)

Aviculopecten princeps (Conrad)

Locality 20. Perry County, gap in Little Mountain north of Cranes Gap. The Oriskany sandstone here is similar to that observed at Localities 3 and 18, but carries a more varied assemblage:

Faunule 20

Leptaena rhomboidalis (Wilkens)
Dalmanella perelegans (Hall)
Rensselaeria marylandica Hall
Spirifer cumberlandiae Hall

S. cf. intermedius Hall
S. sp.
Catazyga sp.
Brachiopod, indet.

Locality 21. Perry County, at Dellville along the road skirting the north bank of Sherman Creek west of the village. More or less sandy, red shale has a particularly interesting faunule. This is an occurrence of Chemung brachiopods high in the red bed series:

Faunule 21

Spirifer mesacostalis Hall
S. disjunctus Sowerby

Palaeoneilo sp.
Leptodesma sp.

Fish plates, worn and undeterminable

Locality 22. Perry County, on State Highway 5 at picnic grounds, top of ridge south of Roseglen. A whitish sandstone, the Kings Mill sandstone of Claypole,[15] is here interbedded with the red series not far below the fossiliferous horizon at Dellville (Locality 21.) The following Chemung faunule was collected:

Faunule 22

Crinoidea, indet.

Spirifer disjunctus Sowerby

Palaeoneilo cf. plana Hall
Schizodus rhombeus Hall
Pelecypod, indet.

Locality 23. Perry County, on State Highway 5, four miles south of New Bloomfield. A small exposure of dark gray shale with little or no sandstone carries a large Hamilton assemblage:

Faunule 23

Streptlasma rectum (Hall)

Technocrinus spinulosus Hall
Crinoidea, indet.

Reptaria stolonifera Rolle
Fenestella emaciata Hall
Taeniopora exigua Nicholson

Stropheodonta demissa (Conrad)
S. inaequistriata (Conrad)
S. sp.
Schuchertella cf. variabilis Prosser
Chonetes lepidus Hall
Rhipidomella vanuxemi Hall
Schizophoria striatula (Schlotheim)
Camarotoechia prolifica Hall
Liorhynchus laura (Billings)
L. sp.
Tropidoleptus carinatus (Conrad)
Atrypa reticularis (Linneus)

Spirifer audaculus (Conrad)
S. mucronatus (Conrad)
S. granulosus (Conrad)
S. cf. tullius Hall
Ambocoelia umbonata (Conrad)
Athyris spiriferoides (Eaton)

Nucula varicosa Hall
Palaeoneilo emarginata (Conrad)
Pterinopecten cf. vertumnus Hall
Modiomorpha cf. concentrica (Conrad)

Platyceras cf. concinum Hall
Tentaculites bellulus Hall

Orthoceras cf. telamon Hall

Phacops rana (Green)
Dalmanites boothi (Green)
D. cf. marylandica Prosser
Trilobite, indet.

Locality 24. Perry County, one-half mile north of Juniata Furnace at cross roads. A small outcrop of dark gray shale supplied Hamilton fossils (compare with Locality 23, faunule 23):

Faunule 24

Coral, indet.

Crinoidea, indet.

Taeniopora exigua Nicholson
Bryozoa, indet.

Chonetes vicinus (Castelnau)
Rhipidomella vanuxemi Hall
Tropidoleptus carinatus (Conrad)
Atrypa reticularis (Linneus)

Spirifer granulosus (Conrad)
S. mucronatus (Conrad)
Vitulina pustulosa Hall

Nucula sp.
Palaeoneilo emarginata (Conrad)
Modiomorpha subalata (Conrad)

Platyceras auriculatum Hall

Phyllocarid, indet.

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[15] Claypole, E. W., Second Pennsylvania Geological Survey: Vol. F2, Perry County, pp. 393-394, 1885.

TABLE I. FAUNAL CHART OF FIRST DISTRICT

In this chart, localities from which Oriskany fossils were collected are omitted. Also, in listing species, the following groups are not included due to their scarcity or unsatisfactory identification: Porifera, Echinodermata, "Vermes," Bryozoa, Pisces, Plantae.

Localities	1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	21	22	23	24
COELENTERATA																					
Streptelasma rectum																				x	
Zaphrentis chemungensis													x								
Amplexus hamiltoniae										x											
Craspedophyllum archiaci										x											
BRACHIOPODA																					
Lingula punctata		?																			
Schizodus sp. nov.		x																			
Stropheodonta perplana	x															x					
S. demissa		x											x	?						x	
S. inaequistriata																				x	
S. concava																	x				
S. maynardi								x							x						
Leptostrophia perplana var. nervosa												x			x						
L. interstrialis													x								
Leptaena rhomboidalis																	x				
Schuchertella chemungensis												x			x						
S. variabilis																	?			?	
Chonetes coronatus		x	x								x						x				
C. scitulus		?			x						x						x				
C. lepidus					x						x									x	
C. vicinus											x										x
C. marylandicus																	x				
C. lepiformis		x							x												
Productella lachrymosa						x	x							x	x						
Rhipidomella vanuxemi												x			x					x	x
R. penelope																x					
R. leucosia											x										
Schizophoria striatula									x			x		x	x					x	
Camarotoechia congregata	x													x							
C. congregata var. parkheadensis															x						
C. prolifica	x																			x	
C. contracta													x								
C. eximia															x						
Liorhynchus laura																				x	
L. quadricostatum														?							

TABLE I. FAUNAL CHART OF FIRST DISTRICT—Continued

Localities	1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	21	22	23	24
L. mesacostale		x		x							x										
L. globuliforme								x	x			x			x						
Tropidoleptus carinatus	x					x					x		x	x	x					x	x
Atrypa recticularis	x			x		x	x			x		x		x	x		x			x	x
Cyrtina hamiltonensis						x			x					x	x		x				
Spirifer audaculus	x		x							x	x			x						x	
S. angustus	x										x										
S. marcyi var. superstes							x						?								
S. mucronatus	x		x		x					x	x					x	x			x	x
S. mucronatus var. posterus		x		x				?	x			x		?	x						
S. granulosus	x		x							x						x				x	x
S. tullius	?															?				?	
S. mesastrialis				x			x					?			x						
S. mesacostalis							x	x				x		x	x			x			
S. disjunctus							x						x					x	x		
Elytha fimbriatus						x							x			x					
Ambocoelia umbonata										x										x	
Vitulina pustulosa																					x
Athyris spiriferoides	x			x								x			x					x	
PELECYPODA																					
Orthonota undulata											x										
Grammysia communis												x									
G. arcuata		x									x										
Nucula corbuliformis														x							
N. varicosa																				x	
N. bellistriata											x										
Nuculites oblongatus														?							
Palaeoneilo plana															x				?		
P. emarginata		x																		x	x
P. brevis												x									
P. tenuistriata		?																			
Pterinea flabellum	x																				
P. chemungensis								x						?							
P. prora														x							
Liopteria linguliformis															?						
Leptodesma lichas													x								
Ectodesma birostratum												x									
Actinopteria epsilon															x						
A. boydi		x													x						
Schizodus rhombeus																			x		
Aviculopecten princeps	x																x				

TABLE I. FAUNAL CHART OF FIRST DISTRICT—Continued

Localities	1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	21	22	23	24
A. faciculatus	x																				
Pterinopecten vertumnus																				?	
P. undosus											x										
Modiomorpha concentrica											x									?	
M. subalata																					x
Goniophora truncata		x																			
Paracyclas lirata					x																
GASTROPODA																					
Pleurotomaria sulcomarginata	x				x						?										
P. capillaria						x					x										
Bellerophon nactoides								x							x						
B. leda											x										
B. thalia																?					
B. clarki								x													
Bucanopsis macra								x							?						
Loxonema hamiltoniae																x					
Platyceras concinnum																				?	
P. auriculatum																					x
Diaphorostoma lineatum								x													
Tentaculites bellulus							x													x	
T. descissus							x		x												
T. spiculus									x												
CEPHALOPODA																					
Orthoceras talamon																				?	
ARTHROPODA, CRUSTACEA																					
Homolonotus dekayi											x										
Phacops rana											?									x	
Dalmanites boothi																x				x	
D. marylandicus																				?	
Mesothyra oceani						x															

SECOND DISTRICT

Region of the Forks of the Susquehanna

Williams and Kindle[16] studied the Middle and Upper Devonian in what they designated as the "Cattawissa Section" south of Bloomsburg. Of it they wrote: "Susquehanna River cuts across the strike of the southward-dipping beds of the Montour anticline between the town of Catawissa and East Bloomsburg station, exposing in a continuous section the beds of the Devonian from the Hamilton formation up to the lowest "red beds." * * * the resulting section is probably not surpassed, if equaled, by any other in Pennsylvania in the opportunity which it affords for the study of upper Devonian faunas. * * * throughout this whole fossiliferous zone of the Cattawissa section, up to the appearance of the characteristic red sediment of the Catskills, no characteristic Chemung species have been discovered. Using the Ithaca section as a standard, the Catawissa section * * * must be correlated with the Hamilton, Genesee, and Nunda (including the Ithaca member in the latter) formations." The greatest significance of this section is the influx of red sediments in late Portage time and the absence of recognized Chemung marine fossils. Since the work of Williams and Kindle on the Upper Devonian is so complete, data now offered relate only to the Middle Devonian.

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[16] Ibid. pp. 65-86.

Locality 1. Columbia County, along the Pennsylvania Railroad across the river from Bloomsburg. The eastern end of the section is nearly opposite Espy in beds probably equal to the "Tully" of Williams and Kindle in the Catawissa section. Westward, below this horizon, although never far below since we are following a near-strike section, are gray, shaly, brown-weathering sandstones. Above the "Tully" occurs dark shale presumably of Genesee age. The pre-"Tully" beds studied along the railroad are all of nearly the same horizon. Seven fossiliferous exposures were found at intervals for a mile and a half along the strike. The combined faunal list assigned unquestioningly to the Hamilton follows:

Faunule 25

Zaphrentis cf. prolifica (Billings)

Crinoidea, indet.

Glauconome sp.
Fenestella sp.
Bryozoa, indet.

Stropheodonta demissa (Conrad)
S. perplana (Conrad)
S. inaequistriata (Conrad)
Leptaena rhomboidalis (Wilkens)
Chonetes vicinus (Castelnau)
C. scitulus Hall
Rhipidomella vanuxemi Hall
R. sp.
Schizophoria striatula (Schlotheim)
Tropidoleptus carinatus (Conrad)
Atrypa reticularis (Linneus)
Cyrtina hamiltonensis Hall
Spirifer audaculus (Conrad)
S. angustus Hall
S. mucronatus (Conrad)
S. granulosus (Conrad)
Elytha (Reticularia) fimbratius (Conrad)
Nucleospira concinna (?) Hall
Anoplotheca cf. camilla (Hall)
Vitulina pustulosa Hall
Athyris spiriferoides (Eaton)

Grammysia sp.
Nucula corbuliformis Hall
N. bellistriata (?) (Conrad)
Palaeoneilo sp.
Modiomorpha concentrica (Conrad)

Loxonema hamiltoniae Hall

Phacops rana (Green)
P. sp.

Plantae

Locality 2. Northumberland County, Selinsgrove Junction section south of Sunbury along the east bank of Susquehanna River. Williams and Kindle[17] discussed only the Upper Devonian from their "Hollowing Run section" six to seven miles south of Sunbury and corresponding to the southern end of the Second Survey's Selinsgrove Junction section. In many ways the "Hollowing Run section" is identical with the "Catawissa section," particularly in the absence of marine Chemung since the red beds begin in Portage time. As with Catawissa, new information will be here limited to the Hamilton, because we have nothing else important to add to the work of Williams and Kindle. The Selinsgrove Junction section is more complete than that at Catawissa. It begins in the Upper Silurian and runs the entire gamut into the red beds*. In dark gray to olive gray, shaly sandstone and shale south of the railroad bridge occurs the following Hamilton faunule:

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[17] Ibid. pp. 86-92.

Faunule 26

Streptelasma cf. rectum (Hall)

Crinoidea sp.

Bryozoa, indet.

Stropheodonta perplana (Conrad)
S. inaequistriata (Conrad)
Leptaena rhomboidalis (Wilkens)
Chonetes scitulus Hall
C. coronatus (Conrad)
C. cf. rugosus Kindle
C. lepidus Hall
C. mucronatus Hall
Leptaenisca cf. australis Kindle
Rhipidomella vanuxemi Hall
R. leucosia (?) Hall
Camarotoechia prolifica Hall
C. congregata (Conrad)
Tropidoleptus carinatus (Conrad)
Atrypa spinosa (?) Hall
Spirifer audaculus (Conrad)
S. mucronatus (Conrad)
Ambocoelia umbonata (Conrad)
Nucleospira concinna Hall
Vitulina pustulosa (?) Hall
Athyris spiriferoides (Eaton)

Pterinea flabellum (Conrad)
Cypricardinia indentata (Conrad)

Loxonema hamiltoniae Hall

Phacops rana (Green)

Locality 3. Northumberland County. Abandoned quarry north of Dewart across the railroad from highway. Coarse, gray, rather massive, brown-weathering, fossiliferous Oriskany sandstone is exposed.

Faunule 27

Leptaena rhomboidalis var. ventricosa (?) (Hall)
Schuchertella deformis (Hall)
Rhipidomella musculosa (Hall)
Hipparionyx proximus Vanuxem
Camarotoechia barrandii (Hall)
Rensselaeria ovalis (Hall)
R. ovoides (Eaton)
Spirifer murchisoni Castelnau
Anoplotheca flabellites (Conrad)
Meristella cf. lata (Hall)
Brachiopod, indet.

Actinopteria communis (Hall)

Locality 4. Northumberland County, along the Pennsylvania Railroad, east side of Susquehanna River, northwest from Northumberland. The highest fossils were found two and one-fourth miles northwest of the forks of the Susquehanna in gray, somewhat sandy, brown-weathering shale. The transition into the red beds was not observable on this side of the river, but red strata come in across the stream to the south and imply that this horizon is not far beneath their base. Evidently, there is little room for marine Chemung here, a condition similar to those at Catawissa and Hollowing Run (see Localities 1 and 2, this district.)

Faunule 28

Crinoidea, indet.

Bryozoa, indet.

Loxopteria sp.

Plantae

Locality 5. Northumberland County, 1300 feet north of Locality 4. A massive, brown sandstone lens and associated shalier beds carry a few Ithaca (?) fossils.

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*For a discussion of the entire section with its faunas see: Willard, B., The Devonian section at Selinsgrove Junction, Pennsylvania: Am. Midland Naturalist, Vol. XIII, no. 4, pp. 222-235, 1932.

Faunule 29

Crinoidea, indet.

Bryozoa, indet.

Leptostrophia interstrialis (Vanuxem)
Dalmanella sp.
Productella lachrymosa (Conrad)
Cyrtina hamiltonensis Hall
Spirifer mesacostalis Hall
S. mucronatus var. posterus (?) Hall and Clarke

Actinopteria boydi (Conrad)

Locality 6. Northumberland County, 800 feet north of Locality 5. A gray, sandy shale yielded the following species assigned to the Ithaca:

Faunule 30

Coral, indet.

Crinoidea, indet.

Bryozoa, indet.

Schuchretella cf. elliptica Clarke and Swartz
Rhipidomella vanuxemi (Hall)
Camarotoechia eximia (Hall)
C. contracta (Hall)
C. orbicularis (?) (Hall)

Leptodesma medon (?) Hall

Locality 7. Northumberland County, 1900 feet north of Locality 5. In a dark shale occurs the following fauna. It is evidently Portage.

Faunule 31

Crinoidea, indet.

Fenestella sp.
Broyozoa, indet.

Obriculoidea cf. neglecta Hall
Douvillina cayuta (Hall)
Schuchertella chemungensis (Conrad)
Chonetes scitulus Hall
C. lepidus Hall
Rhipidomella vanuxemi (Hall)
Camarotoechia eximia (Hall)
Liorhynchus globuliforme (Vanuxem)
Cryptonella cf. rectirostra Hall
Tropidoleptus carinatus (Conrad)
Spirifer sp.
Ambocoelis umbonata (Conrad)

Palaeoneilo emarginata (Conrad)
Parallelodon hamiltoniae (Hall)
Pelecypod, indet.

Phacops rana (?) (Green)

It seems strange that the Portage fauna should be found throughout this section. Possibly there is repetition of beds, but the exposures are so nearly continuous that such a condition is very doubtful.

Locality 8. Northumberland County, immediately north of Locality 7. In brown to gray, brown-weathering, flaggy to submassive sandstone was found the following group of fossils believed to represent the Hamilton:

Faunule 32

Stropheodonta perplana (Conrad)
Camarotoechia prolifica Hall
C. congregata (Conrad)
Tropidoleptus carinatus (Conrad)
Spirifer audaculus (Conrad)
S. mucronatus (Conrad)
Ambocoelia umbonata (Conrad)
Nucleospira concinna Hall
Athyris spiriferoides (Eaton)

Pterinea flabellum (Conrad)

TABLE II. FAUNAL CHART OF SECOND DISTRICT

In this chart, localities from which Oriskany fossils were collected have been omitted. Also, in listing species, the following groups are not included due to their scarcity or unsatisfactory identification: Porifera, Echinodermata, "Vermes," Bryozoa, Pisces, Plantae.

Localities	1	2	5	6	7	8
COELENTERATA						
Streptelasma rectum		?				
Zaphrentis prolifica	?					
BRACHIOPODA						
Orbiculoidea neglecta					?	
Stropheodonta perplana	x	x				x
S. demissa	x					
S. inaequistriata	x	x				
Leptostrophia interstrialis			x			
Douvillina cayuta					x	
Leptaena rhomboidalis	x	x				
Schuchertella chemungensis					x	
S. elliptica				?		
Chonetes mucronatus		x				
C. coronatus		x				
C. scitulus	x	x			x	
C. lepidus		x			x	
C. vicinus	x					
C. rugosus		?				
Leptaenisca australis		x				
Productella lachrymosa			x			
Rhipidomella vanuxemi	x	x		x	x	
R. leucosia		?				
Schizophoria striatula	x					
Camarotoechia congregata		x				x
C. prolifica		x				x
C. contracta				x		
C. orbicularis				?		
C. eximia				x	x	
Liorhynchus globuliforme					x	
Cryptonella rectirostra					?	
Tropidoleptus carinatus	x	x			x	x
Atrypa reticularis	x					
A. spinosa		?				
Cyrtina hamiltonensis	x		x			
Spirifer audaculus	x	x				x

TABLE II. FAUNAL CHART OF SECOND DISTRICT—Continued

Localities	1	2	5	6	7	8
S. angustus	x					
S. mucronatus	x	x				x
S. mucronatus var. posterus			?			
S. granulosus	x					
S. mesacostalis			x			
Elytha fimbriatus	x					
Ambocoelia umbonata		x			x	x
Nucleospira concinna	?	x				x
Anoplotheca camilla	?					
Vitulina pustulosa	x	x				
Athyris spiriferoides	x	x				x
PELECYPODA						
Nucula corbuliformis	x					
N. bellistriata	?					
Palaeoneilo emarginata					x	
Parallelodon hamiltoniae					x	
Pterinea flabellum		x				x
Leptodesma medon				?		
Actinopteria boydi			x			
Modiomorpha concentrica	x					
Cypricardinia indentata		x				
GASTROPODA						
Loxonema hamiltoniae	x	x				
ARTHROPODA, CRUSTACEA						
Phaeops rana	x	x		x	?	

THIRD DISTRICT

North-central Pennsylvania

CAMERON COUNTY

A few localities were visited by Mr. M. N. Shaffner and collections made chiefly in the region of Emporium. A composite list of this fairly plentiful Chemung fauna shows a great paucity of species.

Faunule 33

Crinoidea, indet.

Lingula cf. ligea Hall
Camarotoechia contracta (Hall)
Spirifer disjunctus Sowerby

Grammysia sp.

Fish remains, indet.

POTTER COUNTY

Locality 1. Northwest corner of county. A number of contiguous localities were visited and Chemung fossils collected from brown to greenish-brown sandstone:

Faunule 34

Bryozoa, indet.

Productella lachrymosa (Conrad)
P. sp.
Camarotoechia eximia (Hall)
C. contracta (Hall)
Atrypa reticularis (Linneus)
Spirifer disjunctus Sowerby

Grammysia cf. subarenata Hall
Palaeoneilo plana Hall
Leptodesma sp.
Sphenotus contractus Hall

Plantae (stems)

Locality 2. One mile west of Mills, greenish sandstone exposed along the highway carries a few, badly preserved remains:

Faunule 35

Crinoidea, indet.

Bryozoa, indet.

Productella lachrymosa (Conrad)
Camarotoechia eximia (Hall)

Locality 3. Four miles south of Galeton along the highway. Here in gray to olive gray shale and some sandstone immediately below the alternating red and green Cattaraugus beds, fossils were found. The fauna is peculiar in that it is an assemblage of inarticulate brachiopods, small pelecypods, an eurypterid appendage, and plants. It is believed to represent a brackish water deposit and is presumably Chemung in age.

Faunule 36

Lingula cf. spatulata Vanuxem
L. cf. ligea Hall
L. sp.

Grammysia communis Hall
Nucula cf. globularis Hall
N. sp. nov.

Leptodesma longispinum Hall
L. elongatum Clarke and Swartz
Pelecypod, indet.

Stylonurus sp. nov.

Plantae

Locality 4. Region between Coudersport and Roulette. In brown to olive-brown sandstone a sparce Chemung fauna was collected at several minor outcrops.

Faunule 37

Crinoidea, indet.

Bryozoa, indet.

Productella lachrymosa (Conrad)
Camarotoechia sp.

Spirifer disjunctus Sowerby
Athyris angelica Hall

Palaeanatina typa Hall
Cypricardella cf. nitidula Clarke and Swartz

Plantae

TIOGA COUNTY

Williams and Kindle together[18] and Kindle alone[19] have reported in detail upon the Chemung (and higher) beds of a section extending along the Erie Railroad at Tioga. Because the fossils reported from this section are typical of the Chemung of the county, the species listed by Williams and Kindle are quoted for comparison as follows:

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[18] Ibid., pp. 110-117.
[19] Kindle, E. M., U. S. Geol. Survey, Folio 93, Elkland-Tioga, Pennsylvania, p. 2, 1903.

Fauna from the Tioga section after Williams and Kindle.

Zaphrentis sp.

Stropheodonta (Douvillina) mucronata Conrad
S. (Douvillina) inequistriata
S. (Leptostrophia) perplana var. nervosa
Stropheodonta sp.
Strophonella caelata
Orthothetes chemungensis
Chonetes cf. vicinus
C. scitulus
C. setigerus
Productella lachrymosa
P. cf. lachrymosa
Schizophoria striatula
Dalmanella tioga
Camarotoechia stephani
Leiorhynchus mesacostale
Atrypa reticularis
A. spinosa
Cyrtina hamiltonensis
Spirifer disjunctus
Delthyris mesacostalis
Ambocoelia gregaria
Athyris angelica
A. cf. angelica

Glossites lingualis
G. procerus
Palaeoneilo filosa
Macrodon cf. chemungensis
Leptodesma lichas
L. sp.
Mytilarca chemungensis
Actinopteria sp.
Schizodus chemungensis
S. oblatus
Aviculopecten duplicatus
A. cf. cancellatus
A. striatus
Modiomorpha cf. quadrula

Orthoceras sp.
Manticoceras cf. complanatus

Bellerophon sp.
Platyceras sp.

Fish bones (fragments)

Since, in the sections to be noted, the lithology varies little, it will be understood, unless otherwise stated, that the strata are dominantly gray to greenish or olive gray, brown-weathering sandstones interbedded more or less liberally with gray shale. Limestones have been reported generally in this district, but they seem without notable exception to be nothing more than shell breccias although occasionally several feet thick. For such deposits the term *coquinite*[20] is proposed.

Locality 5. Bear Creek Valley.

Faunule 38

Crinoidea, indet.

Bryozoa, indet.

Craniella cf. hamiltoniae Hall
Leptostrophia perplana var. nervosa (Hall)
Douvillina cayuta (Hall)
D. cf. cayuta (Hall)
Schuchertella chemungensis (Conrad)
Productella lachrymosa (Conrad)
Schizophoria striatula (Schlotheim)
Atrypa reticularis (Linneus)
A. aspersa Schlotheim
A. hystrix Hall
A. spinosa Hall
Spirifer mesacostalis Hall
Ambocoelia umbonata (Conrad)

Grammysia cf. communis Hall
Grammysia sp.
Palaeoneilo plana Hall
Pterinia sp.
Liopteria sp.
Leptodesma rogersi Hall
L. creon Hall
Lunulicardium sp.
Ectenodesma sp.
Mytilarca cf. oviformis (Conrad)
Pelecypod, indet.

Bellerophon trilirata var. juvenis Hall

Orthoceras sp.

Phyllopod, indet.

Attention should be called to the absence from the above fauna of *Spirifer disjunctus* Sowerby, commonly considered a characteristic marker of the Chemung. With the exception of this example, the fauna is one dominated by Upper Devonian species. When, however, it is noted that Bear Creek occupies a stratigraphically low position near the axis of the Sabinsville anticline,[21] it is at once evident that this and sections to be quoted in certain adjoining valleys must lie rather far down in the Chemung. In fact, there is reason to believe that some of these sections may reach the Enfield (uppermost Portage) although the evidence is insufficiently complete for a final conclusion.

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[20] This word, coquinite, is coined from analogy with coquina, a mass of more or less loosely cemented, broken shells. Probably these shell breccias had a similar origin, their chief difference from coquina being their consolidated and indurated condition, all interstices being filled with mud, sand, or other matrix-forming substances.

[21] For a discussion of the structure of this region, see:
Cathcart, S. H., Gas in the Tioga region, Pennsylvania: Pa. Top. and Geol. Survey, Bull. 102, chap. A, edition of August 10, 1932.

Locality 6. Small brook valley west of Beeman.

Faunule 39

Bryozoa, indet.

Productella lachrymosa (Conrad)
Spirifer mesacostalis Hall
Verneuillia cf. chiropteryx de Verneuil

Ambocoelia umbonata (Conrad)

Grammysia elliptica Hall
Palaeanatina typa Hall
Leptodesma rogersi Hall

Locality 7. Mutton Creek valley from Tioga Junction to Jackson Summit.

Faunule 40

Stropheodonta demissa (Conrad)
Douvillina cayuta (Hall)
Schuchertella chemungensis (Conrad)
Productella lachrymosa (Conrad)
P. speciosa Hall
Dalmanella tioga (Hall)
Rhipidomella vanuxemi (Hall)
Schizophoria striatula (Schlotheim)
Camarotoechia orbicularis (Hall)
C. eximia (Hall)
C. sp.

Atrypa reticularis (Linneus)
A. spinosa Hall
A. hystrix Hall
Spirifer mesacostalis Hall
S. disjunctus Sowerby
Ambocoelia umbonata (Conrad)
Athyris angelica Hall

Grammysia sp.
Pterinopecten dispandus Hall
Paracyclas sp.

The similarity of this fauna to that from Bear Creek valley (Locality 5) is at once apparent. However, *Spirifer disjunctus* Sowerby is present in this section. But, it must be observed that this list is a composite assemblage from several exposures just as was that from Bear Creek, but runs higher in the section away from the axis of the Sabinsville anticline. As in most of the neighboring localities, *Ambocoelia umbonata* (Conrad) occurs in myriads,[22] often to the exclusion of all other forms.

Locality 8. Valley of brook between Daily and Smith Creeks:

Faunule 41

Leptostrophia perplana var. nervosa (Hall)
Douvillina cayuta (Hall)
D. arcuata (Hall)
Atrypa hystrix Hall
Spirifer disjunctus Sowerby

Ambocoelia umbonata (Conrad)
Athyris angelica Hall

Leptodesma longispinum Hall
L. sp.
Pterinopecten dispandus Hall

This small assemblage includes *S. disjunctus* Sowerby and represents a somewhat higher horizon than the beds on Bear Creek.

Locality 9. Crooked Creek Valley, west of Tioga at the mouth of Elkhorn Creek:

Faunule 42

Crinoidea, indet.

Bryozoa, indet.

Lingula ligea Hall
Stropheodonta sp.
Leptostrophea perplana var. nervosa (Hall)
Douvillina cayuta (Hall)
D. arcuata (Hall)
Schuchertella chemungensis (Conrad)
Productella speciosa (?) Hall
Schizophoria striatula (Schlotheim)
Atrypa hystrix Hall
A. reticularis (Linneus)
Spirifer mesastrialis Hall
S. disjunctus Sowerby
Ambocoelia umbonata (Conrad)

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[22] Compare with Ambocoelia gregaria of Williams and Kindle.

This faunule was collected from a relatively high horizon a considerable distance down the flank of the anticline and more nearly corresponds to the assemblage from Williams and Kindle's Tioga section.

Locality 10. Elkhorn Creek valley and Farmington Hill region:

Faunule 43

Zaphrentis cf. prolifica Billings

Bryozoa, indet.

Leptostrophia perplana var. nervosa (Hall)
Douvillina cayuta (Hall)
Schuchertella chemungensis (Conrad)
Productella lachrymosa (Conrad)
P. speciosa Hall
Dalmanella tioga (Hall)
Schizophoria striatula (Schlotheim)
Atrypa hystrix Hall
Spirifer mesacostalis Hall
S. disjunctus Sowerby
Ambocoelia umbonata (Conrad)

Palaeoneilo plana Hall

"Fucoids," small

Trails

Locality 11. Along highway at Stokesdale Junction:

Faunule 44

Crinoidea, indet.

Douvillina sp.
Schuchertella chemungensis (Conrad)
Productella lachrymosa (Conrad)
Camarotoechia contracta (Hall)
C. eximia (Hall)
Spirifer disjunctus Sowerby

"Fucoids"
Plant stems

Locality 12. Baldwin Creek Valley:

Faunule 45

Fenestella sp.
Bryozoa, indet.

Leptostrophia perplana var. nervosa (Hall)
Douvillina cayuta (Hall)
D. cayuta var. nov.
Schuchertella chemungensis (Conrad)
Chonetes scitulus Hall
Productella lachrymosa (Conrad)
Atrypa hystrix Hall
Spirifer disjunctus Sowerby
Ambocoelia umbonata (Conrad)

Grammysia sp.
Pterinea cf. chemungensis (Conrad)
Actinopteria epsilon var. nov.

Plant stems

Locality 13. Cummings Creek Valley:

Faunule 46

Crinoidea, indet.

Fenestella sp.
Trematopora sp.

Leptostrophia perplana var. nervosa (Hall)
Atrypa hystrix Hall

Leptodesma medon Hall
L. cf. elongatum Clarke and Swartz

Tentaculites cf. spiculus Hall

"Fucoids," large and small forms

Locality 14. Thornbottom Creek Valley:

Faunule 47

Productella lachrymosa (Conrad)
P. speciosa Hall
P. onusta Hall
Rhipidomella vanuxemi (Hall)
Camarotoechia contracta (Hall)
C. horsfordi (Hall)
Liorhynchus multicostum Hall
Spirifer mesacostalis Hall
S. disjunctus Sowerby
Ambocoelia umbonata (Conrad)
Athyris angelica Hall

Grammysia obsoleta (?) Hall
Palaeanatina sp.
Actinopteria sp.
Goniophora cf. chemungensis Hall

Interesting comparisons may be drawn between this faunule (which is geographically intermediate) and those from Bear Creek to the east and Jemason Creek to the west.

Locality 15. Yarnell Brook valley:

Faunule 48

Crinoidea, indet.

Leptostrophia perplana var. nervosa (Hall)
Productella lachrymosa (Conrad)
P. speciosa Hall
Camarotoechia contracta (Hall)
Liorhynchus multicostum Hall
Spirifer mesascostalis Hall
Ambocoelia umbonata (Conrad)

Leptodesma sp.
Palaeanatina typa Hall

Dynomylostoma beecheri (Eastman)

"Fucoids," small
Plantae, leaf-imprints?

This fauna is strongly suggestive of that collected on Bear Creek (Locality 5) and should be compared therewith and with the remains listed from Jemason Creek (faunule 49.)

Locality 16. Jemason Creek valley: These remains were collected from gray shale outcropping along the west side of the stream and are from the lowest known beds exposed in Tioga County situated practically on the axis of the Sabinsville anticline. The fossils should be compared with those from Bear Creek (Locality 5) and from Yarnell Brook (Locality 15.)

Faunule 49

Lingula cf. spatulata Vanuxem
Douvillina cayuta (Hall)
Camarotoechia cf. eximia (Hall)
Liorhynchus multicostum Hall

L. mesacostale Hall
Spirifer mesacostalis Hall
Brachiopod, indet.

This faunule is interesting since it has a decidedly Portage aspect. *Spirifer disjunctus* Sowerby is absent, and all of these species are reported from Portage beds as well as the Chemung, several going all the way down into the Hamilton[23]. Furthermore, it should be observed that if the Sabinsville anticline be followed to the region of Elmira, New York, it is found to bring the uppermost Portage (Enfield) beds to the surface as exposed in quarries east of the city. There, the Enfield fauna is in gray shale similar to that which carries faunule 49 on Jemason Creek. Although the specimens are too few for final conclusions, it is believed altogether probable that the Enfield does come to the surface on Jemason Creek.

Locality 17. Vicinity of Sabinsville, along railroad and stream bed northward from the village:

Faunule 50

Leptostrophia perplana var. nervosa (Hall)
Douvillina cayuta (Hall)
Schizophoria striatula (Schlotheim)

Atrypa hystrix Hall
Spirifer disjunctus Sowerby

Gastropod, indet.

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[23] See: Williams, H. S., Tarr, R. S. and Kindle, E. M., U. S. Geol. Survey, Folio 169, Watkins Glen-Catatonk, N. Y., p. 6, 1909, for comparison of Portage and Chemung fossils.

Locality 18. Cowanesque Valley. See also faunule 45, Locality 12 for Baldwin Creek. Several localities were visited. A few representative faunules only will be quoted:

Faunule 51a

Bill Hess Creek Valley along Buffalo and Susquehanna Railroad:

Orbiculoidea allegania Hall
Productella lachrymosa (Conrad)
Schizophoria striatula (Schlotheim)
Camarotoechia contracta (Hall)
C. orbicularis (Hall)
Liorhynchus multicostum Hall
L. mesacostale Hall
Spirifer mesacostalis Hall
S. disjunctus Sowerby
Ambocoelia umbonata (Conrad)

Glossites cf. rudicula Hall
Leptodesma curvatum Hall
L. lichas Hall
Lyriopecten magnificus Hall

Phyllopod, indet.

Faunule 51b

One-half mile west of Prichard:

Leptostrophia perplana var. alternata Clarke and Swartz
Douvillina arcuata (Hall)
Productella lachrymosa (Conrad)
P. speciosa Hall
Camarotoechia stevensi Hall
C. cf. horsfordi (Hall)
Spirifer mesacostalis Hall
S. disjunctus Sowerby
Ambocoelia umbonata (Conrad)

"Fucoids"

Faunule 51c

One-half mile north of Elkland along stream valley:

Leptostrophia perplana var. nervosa (Hall)
Schuchertella chemungensis (Conrad)
Productella lachrymosa (Conrad)
Camarotoechia contracta (Hall)
Cryptonella eudora Hall
Spirifer mesacostalis Hall

Locality 19. Region of Charleston. Several localities were visited, principally in creek beds near the village. Since they are believed to be from almost if not quite the same horizon, and the lithology is fine gray sandstone and gray shale throughout, a composite faunule is here given for the entire region.

Faunule 52

Spirophyton sp.

Crinoidea, indet.

Fenestella sp.
Bryozoa, indet.

Douvillina cayuta (Hall)
Schuchertella chemungensis (Conrad)
Productella lachrymosa (Conrad)
P. speciosa Hall
P. cf. hystricula Hall
Schizophoria striatula (Schlotheim)
Camarotoechia contracta (Hall)
C. congregata (Conrad)
C. eximia (Hall)
C. cf. orbicularis (Hall)
Liorhynchus mesacostale Hall
Pugnax pugnus (Martin)
Eunella sp. nov.
Cyrtina hamiltonensis Hall
Spirifer mesacostalis Hall
S. disjunctus Sowerby
Ambocoelia umbonata (Conrad)
Athyris angelica Hall

Glossites lingualis Hall
Palaeoneilo cf. sulcatina (Conrad)
Liopteria sp.
Mytilarca cf. simplex Hall
Lyriopecten cf. priamus Hall
Cypricardella tenuistriata (Hall)
Pelecypod, indet.

Dipterocaris sp. nov. ?

Locality 20. Wellsboro to Mansfield, along highway 6. Several exposures were visited and are presented in order from west to east.

Faunule 53a

2.7 miles east of Wellsboro:

Bryozoa, indet.

Productella lachrymosa (Conrad)
Schizophoria striatula (Schlotheim)
Camarotoechia orbicularis (Hall)
C. contracta (Hall)
C. eximia (Hall)
Eunella sp. nov.
Spirifer mesacostalis Hall

Faunule 53b

2.9 miles east of Wellsboro:

Schuchertella chemungensis (Conrad)
Camarotoechia congregata (Conrad)
C. eximia (Hall)
Liorhynchus mesacostale Hall
Pugnax cf. pugnus (Martin)
Spirifer mesacostalis Hall
Ambocoelia umbonata (Conrad)
Athyris angelica Hall

Leptodesma sp.

Faunule 53c

3.8 miles east of Wellsboro, thin bed of hematite:

Productella lachrymosa (Conrad)
Camarotoechia contracta (Hall)
C. orbicularis (Hall)
C. eximia (Hall)
Spirifer mesacostalis Hall
Ambocoelia umbonata (Conrad)
Athyris angelica Hall
A. sp.

Modiomorpha sp.

Echinocaris sp.

Faunule 53d

5.4 miles east of Wellsboro:

Schuchertella chemungensis (Conrad)
Productella lachrymosa (Conrad)
Schizophoria striatula (Schlotheim)
Camarotoechia horsfordi (Hall)
Cryptonella cf. eudora Hall
Spirifer mesacostalis Hall

Faunule 53e

5.7 miles east of Wellsboro:

Crinoidea, indet.

Bryozoa, indet.

Schizophoria striatula (Schlotheim)
Camarotoechia contracta (Hall)
Spirifer mesacostalis Hall

Locality 21. Elk Run, cliffs along the south bank of South Fork immediately east of confluence of the two forks. This naturally follows after faunule 53e of Locality 20.

Faunule 54

Spirophyton sp.

Crinoidea, indet.

Bryozoa, indet.

Schuchertella chemungensis (Conrad)
Productella lachrymosa (Conrad)
Schizophoria striatula (Schlotheim)
Camarotoechia contracta (Hall)
C. eximia (Hall)
C. orbicularis (Hall)
Pugnax sp.
Spirifer mesacostalis Hall
S. disjunctus Sowerby
Athyris angelica Hall

Palaeoneilo plana Hall
P. cf. angusta Hall

Trail

Spirifer disjunctus Sowerby is present here, although not found along the highway westward to Wellsboro. This is interesting, since these beds may be somewhat higher than those mentioned under Locality 20 and are almost certainly below the principal hematitic horizons from which Williams and Kindle listed so many species including this brachiopod.

The iron ores of the Mansfield region were discussed faunally by Williams and Kindle.[25] These beds occur at several horizons, one of which was encountered in faunule 53e. Since their list is more complete than data collected by the writer, their series follows:

Fossils from Mansfield hematite beds after Williams and Kindle

Orbiculoidea sp.
Strophonella caelata
Orthothetes chemungensis
Chonetes setigerus
Productella arctirostrata
P. boydi
P. lachrymosa
Schizophoria striatula
Camarotoechia contracta
C. stephani
C. sappho
Cryptonella sp.
Delthyris mesacostalis
Atrypa spinosa
Cyrtina hamiltonensis
Spirifer disjunctus
Ambocoelia gregaria
Athyris angelica

Sphenotus contractus
S. cf. rigidus
Grammysia sp.
Glossites cf. depressus
Edmondia philipi
Macrodon chemungensis
Leptodesma sp.
L. lichas
Pterinea ? sp.
Byssopteria radiata
Aviculopecten rugaestriatus
A. sp.
Crenipecten cf. amplus

Euomphalus sp.
Loxonema sp.

Locality 22. Mill Creek immediately east of highway north of Mansfield. Here in red sediments occur the following:

Faunule 55

Lingula spatulata Vanuxem
L. cf. delia Hall
L. cuyahoga Hall

Bothriolepis leidyi Newberry
B. minor Newberry
Ganorhynchus beecheri (?) Newberry

This faunule is curious in being restricted to inarticulate brachipods and fish which occur in red beds. Presumably it is a brackish-water deposit in which case, assuming the fish to be fresh-water dwellers, it suggests that they were swept downstream toward the sea and deposited in brackish water where the *Lingulas* were living and before finally reaching a truly marine environment. The comminuted condition of the fish remains, but the excellent state of preservation of the brachiopods, further substantiate such an assumption.

Locality 23. Kelly Creek valley north of Mansfield.

Faunule 56

Crinoidea, indet.

Douvillina cayuta (Hall)
Schuchertella chemungensis (Conrad)
Productella lachrymosa (Conrad)
Schizophoria striatula (Schlotheim)

Camarotoechia cf. orbicularis (Hall)
C. congregata (Conrad)
Pugnax pugnus (Martin)
Spirifer mesacostalis Hall
S. disjunctus Sowerby

BRADFORD COUNTY

Williams and Kindle [26] described sections and listed fossils from Bradford County. Their more important localities are what they called "The Gulf Brook and Leroy Sections." Their long lists of fossils need not be quoted here, since they are not essentially different from that given by them for the Erie Railroad section at Tioga in Tioga County (see page 23). The subjoined lists of fossils may be looked upon as supplementary to those by Williams and Kindle in that they deal with parts of the county which they did not discuss or with material from exposures made since their studies were finished.

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[25] Ibid. pp. 118-123.
[26] Ibid. pp. 92-110.

Locality 24. On the highway, east side of Burlington. The Franklindale limestone of Williams and Kindle ("Burlington limestone" of the Second Pennsylvania Geological Survey) is here exposed in a quarry. It is a coquinite of broken shells cemented by a red mud matrix and carries the following species:

Faunule 57

Douvillina sp.
Productella lachrymosa (Conrad)
Cryptonella eudora Hall
Spirifer disjunctus Sowerby

Locality 25. Hilltop two and one-half miles south of Rome. Quarries here have been opened in red beds including coquinite like that at Locality 24 and a little lean hematite. The fossils are a peculiar assemblage in that they include a *Spirifer disjunctus* fauna associated with plants and ostracoderms.

Faunule 58

Zaphrentis sp.

Rhipidomella vanuxemi (Hall)
Cryptonella eudora Hall
Eunella sp. nov.
Spirifer mesacostalis Hall
S. disjunctus Sowerby
Athyris sp. nov.

Ostracodermi, indet.

Plant fragments

Locality 26. Rummerfield and Homets Ferry region, chiefly along the Lehigh Valley Railroad and state highway. Gray-green, coarse, sometimes cross-bedded sandstones dominate; the organic remains are usually poorly preserved:

Faunule 59

Bryozoa, indet.

Orbiculoidea alleghania Hall
Leptostrophia perplana var. nervosa (Hall)
Schuchertella chemungensis (Conrad)
Camarotoechia contracta (Hall)
C. horsfordi (Hall)
Cryptonella eudora Hall
Spirifer disjunctus Sowerby

Grammysia elliptica Hall
Leptodesma sociale Hall

Locality 27. Franklindale Narrows. Sandstone and shale, mostly greenish plus a fair percentage of red beds, are here exposed. This locality is probably very near the horizon of Williams and Kindle's "Towanda Narrows section."[27] It is discussed here because our collection came from new road cuttings where fish remains are fairly common. Much of the material was found in debris thrown out during highway construction.

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[27] Ibid., pp. 106-108.

Faunule 60

Douvillina sp.
Productella speciosa Hall
P. lachrymosa (Conrad)
Camarotoechia cf. eximia (Hall)
C. contracta (Hall)
C. orbicularis (Hall)
Cryptonella eudora Hall
Spirifer mesacostalis Hall
S. disjunctus Sowerby

Athyris angelica Hall

Schizodus sp.
Pelecypod, indet.

Bothriolepis minor Newberry
B. sp.
Dinichthys sp.
Fish fragments, indet.

Locality 28. Region of Hollenback. Several minor localities are combined in the following list. Practically all of the material is from the red beds, but a few marine organisms were found in interbedded, non-red strata.

Faunule 61

Productella cf. onusta Hall
Camarotoechia congregata var. nov.
C. horsfordi (Hall)

Pelecypod, indet.

Echinocaris cf. sublaevis Whitfield

Mylostoma sp.
Bothriolepis leidyi Newberry
B. minor Newberry
Holoptychius sp.*
Fish plates, indet.

Archaeopteris cf. obtusa (Lesquereux)

SUSQUEHANNA AND WAYNE COUNTIES

So far as has been ascertained no marine rocks come to the surface in Pennsylvania east of Susquehanna County. Considerable time was spent in searching for fossils in Wayne County, but only an occasional plant impression or worn fish plate was found. All of the marine fossils known from Susquehanna County occur in brown to gray sandstones and occasional gray shales exposed along the Susquehanna Valley from Great Bend eastward to Cascade Creek and thence northward into New York State.

Locality 29. Cuts along the Erie Railroad and highway east of Great Bend. A few fossils occur here in gray, flaggy and concretionary sandstone:

Faunule 62

Chonetes, sp.
Schizophoria striatula (Schlotheim)
Camarotoechia eximia (Hall)
C. contracta (Hall)
C. orbicularis (Hall)

C. congregata (Conrad)
Tropidoleptus carinatus (Conrad)
Athyris angelica Hall
Brachiopod, indet.

Locality 30. Cascade Creek section. This section was described in considerable detail by I. C. White[28] from which he mentioned the species starred in the following list:

Faunule 63

*Crinoidea, indet.

*Productella boydi (Hall)
Camarotoechia eximia (Hall)
*C. contracta (Hall)
C. congregata (Conrad)

*Spirifer mesacostalis Hall
*S. disjunctus Sowerby

Palaeoneilo cf. brevis Hall
P. elongata Hall

Through the generosity of Mr. D. S. Harding of Susquehanna a few miscellaneous specimens were acquired from Susquehanna County.

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* Specimen from Sullivan County, immediately south from Hollenback.

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[28] White, I. C., Second Pennsylvania Geological Survey, Vol. G5, Susquehanna and Wayne counties, pp. 76, 78, 98, 1881.

The localities are not definitely known for all, but it is practically certain that they come from *very* high in the Chemung.

Tracks and trails, various

Archaeopteris obtusa (Lesquereux)
A. halliana (Lesquereux)

Although fish remains occur in nonmarine sediments in this county, chiefly along the Delaware, Lackawanna and Western Railroad south of New Milford, they are too badly worn to identify.

TABLE III. FAUNAL CHART OF THIRD DISTRICT

In this chart, the following groups of organisms have been omitted due to their scarcity or unsatisfactory identification: Porifera, Echinodermata, "Vermes", Bryozoa, Plantae.

a=Cameron County, b=Potter County, c=Susquehanna County. Localities 5-23 inclusive are in Tioga County; localities 24-28 inclusive in Bradford.

Localities	a	b	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	c
COELENTERATA																											
Zaphrentis prolifica								?																			
BRACHIOPODA																											
Lingula delia																				?							
L. ligea	?	?					x																				
L. spatulata		?												?						x							
L. cayuhoga																				x							
Orbiculoidea allegania																x								x			
Craniella hamiltoniae			?																								
Stropheodonta demissa					x																						
Leptostrophia perplana var. nervosa			x			x	x	x		x	x		x		x	x								x			
L. perplana var. alternata																x											
Douvillina cayuta			x		x	x	x	x		x				x	x	x	x				x						
D. arcuata						x	x									x											
Schuchertella chemungensis			x		x		x	x	x	x						x	x	x	x		x			x			
Chonetes scitulus										x																	
Productella lachrymosa		x	x	x	x			x	x	x		x	x			x	x	x	x		x	x			x		
P. speciosa					x		?	x				x	x			x	x	x							x		
P. hystricula																	?										
P. onusta												x														x	
P. boydi																											x
Dalmanella tioga					x			x																			
Rhipidomella vanuxemi					x							x											x				

TABLE III. FAUNAL CHART OF THIRD DISTRICT—Continued

Localities	a	b	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	c
Schizophoria striatula			X		X		X	X							X	X	X	X	X		X						X
Camarotoechia congregata																	X	X			X						X
C. contracta	X	X							X			X	X			X	X	X	X					X	X		X
C. horsfordi												X				?		X						X		X	
C. orbicularis					X											X	?	X	X		?				X		X
C. eximia		X			X				X					?			X	X	X						?		X
C. stevensi																X											
Liorhynchus mesacostale														X		X	X	X									
L. multicostum												X	X	X		X											
Pugnax pugnus																	X	?			X						
Cryptonella eudora																X		?				X	X	X	X		
Eunella sp. nov.																	X	X					X				
Tropidoleptus carinatus																											X
Atrypa reticularis		X	X		X		X																				
A. spinosa			X		X																						
A. hystrix			X		X	X	X	X		X	X				X												
A. aspersa			X																								
Cyrtina hamiltonensis																	X										
Spirifer mesastrialis							X																				
S. mesacostalis			X	X	X			X				X	X	X		X	X	X	X		X		X		X		X
S. disjunctus	X	X			X	X	X	X	X	X		X			X	X	X		X		X	X	X	X	X		X
Verneuillia chiropteryx				?																							
Ambocoelia umbonata			X	X	X	X	X	X		X		X	X			X	X	X									
Athyris angelica		X			X	X						X					X	X	X						X		X
PELECYPODA																											
Grammysia elliptica				X																				X			
G. subarcuata		X																									
G. communis		X	?																								
G. obsoleta												?															
Glossites rudicula																?											
G. lingualis																	X	X									
Palaeanatina typa		X		X									X														
Nucula globularis		?																									
Palaeoneilo plana		X	X					X											X								
P. brevis																											?
P. angusta																			?								
P. sulcatina																	?	?									
P. elongata																											X
Pterinea chemungensis										?																	
Leptodesma rogersi			X	X																							
L. longispinum		X				X																					

TABLE III. FAUNAL CHART OF THIRD DISTRICT—Continued

Localities	a	b	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	c
L. medon											X																
L. lichas																X											
L. elongatum		X									?																
L. creon			X																								
L. sociale																								X			
L. curvatum																X											
Mytilarca oviformis			?																								
M. symplex																	?										
Lyriopecten magnificus																X											
L. priamus																	?										
Pterinopecten dispandus					X	X																					
Goniophora chemungensis												?															
Sphenotus contracta		X																									
Cypricardella nitidula		?																									
C. tenuistriata																	X										
GASTROPODA																											
Bellerophon trilirata var. juvenis			X																								
Tentaculites spiculus											?																
ARTHROPODA, CRUSTACE																											
Echinocaris sublaevis																										?	
VERTEBRATA, PISCES																											
Bothriolepis leidyi																				X						X	
B. minor																				X					X	X	
Ganorhynchus beecheri																				?							
Dynomylostoma beecheri													X														

FOURTH DISTRICT

Upper Delaware Valley

Prosser[29] made large collections in Pike and Monroe counties. Little can be added to the long lists of species which he has left us. A few localities mentioned with their faunas are inserted here either because they have become accessible since Prosser's time, or to show that our material checks with his. Attention is called to the following significant statement by Prosser[30], a statement fully substantiated by the writer's data: "After considerable field work in southeastern New York and northeastern Pennsylvania, the conclusion is reached that the marine faunas terminated either slightly in advance or soon after the appearance of the Chemung stage. In central and southern Pennsylvania and western Maryland the conditions seem to have been more favorable, and *Spirifer disjuncta* with other Chemung species occurs in rocks which are stratigraphically equivalent to the unfossiliferous beds farther toward the northeast."

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[29] Ibid. pp. 1-39, etc. Although treating with some New York localities, this bulletin is devoted chiefly to northeastern Pennsylvania.

[30] Ibid. p. 12.

Locality 1. Bluffs northwest of Port Jervis, New York. A few exposures were visied here and along Delaware River. The following Hamilton species are representative of this region:

Faunule 64

Bryozoa, indet.

Camarotoechia prolifica Hall
C. horsfordi (Hall)
Tropidoleptus carinatus (Conrad)
Spirifer cf. audaculus (Conrad)
S. mucronatus (Conrad)
S. granulosus (Conrad)

Locality 2. Pike County, bluffs north of Matamoras. Here, in a talus of gray, brown-weathering, unusually hard sandstone plus some shaly material which has fallen from the bluffs, occurs a Hamilton assemblage:

Faunule 65

Crinoidea, indet.

Lingulella planiformis Hall
Orbiculoidea sp.
Stropheodonta demissa (Conrad)
S. perplana (Conrad)
S. sp.
Chonetes vicinus (Castelnau)
Rhipidomella vanuxemi Hall
Spirifer angustus Hall
S. granulosus (Conrad)
Athyris cf. cora Hall

Palaeoneilo emarginata (Conrad)
Aviculopecten faciculatus Hall
Pelecypod, indet.

Plant fragments

Locality 3. Pike County, four miles west-northwest of Milford on State Highway 692. In dark gray shale which weathers light and papery, occurs the following group, curious bacause of the predominance of pelecypods. It is interpreted as Hamilton in age and is stratigraphically close to similar faunas recognized by Prosser.

Faunule 66

Chonetes cf. lepidus Hall
Camarotoechia cf. horsfordi (Hall)
Cryptonella sp.
Reticularia sp.
Spirifer cf. mucronatus (Conrad)

Phthonia cf. cylindrica Hall
P. cf. nodicostata Hall
Grammysia bisulcata (Conrad)
Nucula lirata (Conrad)
Nuculites oblongatus Conrad
Palaeoneilo emarginata (Conrad)
Parallelodon sp.
Liopteria conradi Hall
L. sp.
Actinopteria boydi (Conrad)
A. cf. subdecussata Hall
Cypricardella tenuistriata (Hall)
C. bellistriata (Conrad)

Locality 4. Pike County. Ascending the valley of the second brook east of Delaware Post Office, the following specimens were collected from dark, shaly, Hamilton sandstone:

Faunule 67

Crinoidea, indet.

Bryozoa, indet.

Chonetes sp.
Camarotoechia congregata (Conrad)
Spirifer mucronatus (?) (Conrad)

Actinopteria sp.
Pterinopecten undosus Hall

Phacops sp.

Locality 5. Monroe County, valley of Marshalls Creek, ascending from Marshalls Creek village. In chocolate-colored shaly sandstone is an abundant Hamilton fauna:

Faunule 68

Zaphrentis prolifica Billings

Crinoidea, indet.

Orbiculoides cf. lodiensis var. media Hall
Rhipidomella penelope Hall
Camarotoechia sp.
Tropidoleptus carinatus (Conrad)
Spirifer audaculus (Conrad)
S. mucronatus (Conrad)
S. granulosus (Conrad)

Vitulina pustulosa Hall
Athyris spiriferoides (Eaton)

Orthonota undulata Conrad
Mytilarca sp. nov.
Actinopteria subdecussata Hall
Modiomorpha concentrica (Conrad)
Pelecypod, indet.

Cyclonema liratum Hall

Plantae, indet.

Locality 6. Monroe County, quarry at north side of Stroudsburg. This opening is in typical Marcellus black shale and is the only locality which the writer has seen in Pennsylvania at which this member carries more than an occasional brachiopod or pteropod. Here a numerous and varied fauna was found[31]. It is strange that Prosser did not list this fauna completely.

Faunule 69

Bryozoa, indet.

Lingula cf. delia Hall
L. ligea Hall
Orbiculoidea sp.
Craniella cf. hamiltoniae Hall
Craniella ?
Chonetes mucronatus Hall
C. scitulus Hall
C. setigerus (Hall)
Stropholosia truncata (Hall)
Camarotoechia prolifica Hall
Liorhynchus limitare (Vanuxem)
L. laura (Billings)
L. laura (?) (Billings)
Tropidoleptus carinatus (Conrad)
Spirifer mucronatus (?) (Conrad)
Ambocoelia umbonata Conrad
A. nana Grabau
Brachiopod, indet.

Paracuka costata Hall
Nuculites triqueter Conrad
Liopteria laevis Hall
Lunulicardium curtum Hall
Actinopteria muricata Hall
Nyassa subalata Hall
Aviculopecten invalidus Hall
A. scabridus Hall
Allocardium alternatum (?) Hall
Modiomorpha alta (Conrad)

Styliolina fissurella (Hall)

Nephritoceras bucinum (Hall)
Bactrites cf. clavus Hall

Phyllocarid, indet.

Onychodus sigmoides (?) Newberry

Plantae, indet.

Locality 7. Monroe County, along Highway 90 north from Stroudsburg opposite Gravel Place. White[32] described what he thought to be the Tully limestone of this region. Here, indeed, a coral zone is exposed, but it occurs in the midst of the Hamilton. Prosser does not appear to have collected from this particular exposure. This may be accounted for by the fact that most of the writer's material was taken from new rock cuts on the highway or debris thrown out in making them. Neither of these sources was available to Prosser. He evidently ran upon the same horizon along the valley of Brodhead Creek to the east and listed therefrom a large Hamilton assemblage. The rock on the highway is a porous, brown, shaly to sandy deposit, doubtless highly calcareous, not as a true limestone but rather from the abundance of remains of lime-secreting organisms present. The following Hamilton fauna was collected in the "reef" and in beds immediately over- or underlying it.

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[31] Commonly, the Marcellus of Pennsylvania carries only *Liorhynchus limitare* (Billings) and *Styliolina fissurella* Hall. For a discussion of the fauna see: Willard, B., A Marcellus fauna from Stroudsburg, Pennsylvania, American Jour. of Sci., 5th Ser., Vol. 24, no. 140, pp. 147-151, 1932.

[32] White, I. C., Second Pennsylvania Geol. Survey, Vol. G6, Pike and Monroe counties, pp. 109 and 213, 1882.

Faunule 70

Pleurodictyum sp.

Streptelasma rectum (Hall)
Zaphrentis prolifica Billings
Z. simplex Hall
Z. sp.
Amplexus cf. hamiltoniae Hall
Aulacophyllum sp.
Craspedophyllum archiaci (Billings)
Ceratopora cf. dichotoma Grabau
C. jacksoni Grabau
Syringopora cf. maclurei Billings
Favosites cf. hamiltoniae Hall
F. cf. clausus Romiger
Corals, indet.

Crinoidea, indet.

Hederella ?
Monticulopora sp.
Fenestella cf. biperforata Hall
F. cf. laevinodata Hall
F. cf. parallela Hall
F. sp.
Thamniscus sp.
Taeniopora exigua Nicholson
Bryozoa, indet.

Stropheodonta demissa (Conrad)
S. perplana (Conrad)
Chonetes mucronatus Hall
Productella spinulicosta Hall
Dalmanella sp.
Rhipidomella vanuxemi Hall
Schizophoria striatula (Schlotheim)
Camarotoechia congregata (Conrad)
C. contracta (Hall)
Liorhynchus cf. multicostum (Hall)
L. sp.
Tropidoleptus carinatus (Conrad)
T. cf. occidens Hall
Atrypa reticularis (Linneus)
Spirifer angustus Hall
S. mucronatus (Conrad)
S. granulosus (Conrad)
S. sculptilis Hall
Elytha (Reticularia) fimbriatus (Conrad)
Nucleospira concinna Hall
Athyris spiriferoides (Eaton)
A. cf. cora Hall
A. sp.
Brachiopod, indet.

Liopteria sp.
Actinodesma erectum (Conrad)
A. sp.
Aviculopecten sp.
Modiomorpha concentrica (Conrad)
Pelecypod, indet.

Turbo sp. nov.

Spiroceras sp.

Phacops rana (Green)
P. sp.
Dalmanites boothi (Green)

Locality 8. Monroe County, continuing north from Locality 7 to where the road crosses Brodhead Creek. In dark, sandy shale at and under the bridge, the following fossils, probably of upper Hamilton age, were found:

Faunule 71

Crinoidea, indet.

Atrypa reticularis (Linneus)
Spirifer cf. granulosus (Conrad)
S. mucronatus (Conrad)
S. angustus Hall

Grammysia arcuata (Conrad)

Cephalopod, indet.

Phacops cf. rana (Green)
Dalmanites boothi (Green)

Locality 9. Monroe County, eastward from Locality 8 at the first crossroads and thence northward toward Analomink. Road cuts expose strata which, judging from their faunal contents and position relative to the beds at Localities 7 and 8, are Ithaca in age.

Faunule 72

Stropheodonta perplana var. nervosa (Hall)
Douvillina cayuta (Hall)
Camarotoechia cf. eximia (Hall)
Spirifer mucronatus var. posterus (?) Hall and Clarke
S. cf. angustus Hall

Grammysia sp.
Leda cf. obscura Hall
Leptodesma rogersi Hall
L. aviforme Hall
Modiomorpha tioga Hall
Paracyclas sp. nov.
Pelecypod, indet.

Pleurotomaria (Bembexia) sulcomarginata (Conrad)
Cyclonema sp. nov.

Echinocaris cf. multinodosa Whitfield

TABLE IV. FAUNAL CHART OF FOURTH DISTRICT

In this chart, the following groups of organisms have been omitted due to their scarcity or unsatisfactory identification: Porifers, Echinodermata, "Vermes", Pisces, Plantae.

Localities	1	2	3	4	5	6	7	8	9
COELENTERATA									
Streptelasma rectum							x		
Zaphrentis prolifica					x		x		
Z. simplex							x		
Amplexus hamiltoniae							?		
Craspedophyllum archiaci							x		
Ceratopora dichotoma							?		
C. jacksoni							x		
Syringopora maclurei							?		
Favosites hamiltoniae							?		
F. clausus							?		
BRACHIOPODA									
Lingula delia						?			
L. ligea						x			
Lingulella planiformis		x							
Orbiculoidea lodiensis var. media					?				
Craniella hamiltoniae						?			
Stropheodonta perplana		x					x		
S. demissa		x					x		
Leptostrophia perplana var. nervosa									x
Douvillina cayuta									x
Chonetes mucronatus						x	x		
C. scitulus						x			
C. lepidus			?						
C. vicinus		x							
C. setigerus						x			
Stropholosia truncata						x			
Productella spinulicosta							x		
Rhipidomella vanuxemi		x					x		
R. penelope					x				
Schizophoria striatula							x		
Camarotoechia congregata				x			x		
C. prolifica	x					x			
C. contracta							x		
C. eximia									x
C. horsfordi	x		?						
Liorhynchus limitare						x			

TABLE IV. FAUNAL CHART OF FOURTH DISTRICT—Continued

Localities	1	2	3	4	5	6	7	8	9
L. laura						X			
L. multicostum							?		
Tropidoleptus carinatus	X				X	X	X		
T. occidens							?		
Atrypa reticularis							X	X	
Spirifer angustus		X					X	X	?
S. audaculus	?				X				
S. mucronatus	X		?	?	X	?	X	X	
S. mucronatus var. posterus									X
S. granulosus	X	X			X		X	?	
S. sculptilis							X		
Elytha fimbriatus							X		
Ambocoelia umbonata						X			
A. nana						X			
Nucleospira concinna							X		
Vitulina pustulosa					X				
Athyris spiriferoides					X		X		
A. cora		?					?		
PELECYPODA									
Phthonia cylindrica			?						
P. nodicostata			?						
Orthonota undulata					X				
Grammysia arcuata								X	
G. bisulcata			X						
Panenka costata						X			
Nucula lirata			X						
Nuculites oblongatus			X						
N. triqueter						X			
Palaeoneilo emarginata		X	X						
Leda obscura									?
Liopteria conradi			X						
L. laevis						X			
Leptodesma rogersi									X
L. aviforme									X
Lunulicardium curtum						X			
Actinodesma erectum							X		
Actinopteria subdecussata			?		X				
A. boydi			X						
A. muricata						X			
Nyassa subalata						X			
Aviculopecten faciculatus									

TABLE IV. FAUNAL CHART OF FOURTH DISTRICT—Continued

Localities	1	2	3	4	5	6	7	8	9
A. invalidus						x			
A. scabridus						x			
Pterinopecten undosus				x					
Allocardium alternatum						?			
Modiomorpha concentrica					x		x		
M. alta						x			
M. tioga									x
Cypricardella bellistriata			x						
C. tenuistriata			x						
GASTROPODA									
Pleurotomaria sulcomarginata									x
Cyclonema liratum					x				
Styliolina fissurella						x			
CEPHALOPODA									
Nephriticeras bucinum						x			
Bactrites clavus						x			
ARTHROPODA, CRUSTACEA									
Phacops rana							x	x	
Dalmanites boothi							x	x	
Echinocaris multinodosa									x

SUMMARY

FIRST DISTRICT. The Devonian groups recognized in this area are: Chemung (including much of the so-called "Catskill" red beds), Portage (divided into Parkhead, Ithaca, and, doubtfully, Sherburne), unquestionably Genesee, and also Hamilton, Marcellus, Onondaga, Oriskany (divided into Ridgely and Shriver members) and Helderburg. The listed faunules represent the Oriskany, Hamilton, Portage (Ithaca and Parkhead) and Chemung. In general these are clearly established, although some uncertainty exists as to the subdivisions of the Portage depending, chiefly, upon lithological distinctions. Southern affinities in the faunules are noted, particularly the Oriskany whose fossils are far more closely related to those of this group in Maryland than to the typical New York Oriskany. Lithologically, too, it resembles the Maryland type in its two members. In the Portage the presence of Parkhead elements suggests southern relationships. The Chemung fauna is not abundantly represented, although a great thickness of strata is assignable to this group. The marine invertebrates of Chemung age appeared first in a truly salt-water environment and survived long after the beginning of the deposition of the red "Catskill." *Spirifer disjunctus* Sowerby is known from horizons perhaps 2000 feet above the base of the red beds. It may suffer dwarfing, and sometimes occurs alone except for ostracoderm plates. However, in the case of the Kings Mill sandstone, a normal, though limited, marine Chemung faunule re-appears high in the red series.

SECOND DISTRICT. Marine beds assignable to the Ithaca, Sherburne, Hamilton, Marcellus, Onondaga, Esopus (?), Oriskany and Helderburg are known. Non-marine Chemung is also present. The occurrence of the Nunda and Genesee is uncertain. There are stratigraphic reasons for supposing that the Tully, too, is present. Unlike the First District, some of the faunas have a much closer New York than Maryland affinity. This is brought out when the Oriskany faunule from Dewart is compared with those from the First District and with the typical New York and Maryland assemblages. No Parkhead has been definitely recognized in the Portage. Probably the most significant feature is the absence of recognized, marine Chemung. Williams and Kindle observed that the red beds had their inception in late Portage time. This should be borne in mind in comparing conditions here with those in the other districts, particularly the Fourth, where no marine Chemung is unquestionably present, although its presence is established in the First and Third districts.

THIRD DISTRICT. Except for certain beds assigned provisionally to the Enfield or uppermost Portage, the identity of which has not been fully and unequivocally established, all of the marine Devonian of this region is of Chemung age. The number and variety of the fossils is evident from Table III. As in the First District, the Chemung marine fossils occur not only in normal, marine beds, but continue up into the red Cattaraugus ("Catskill"). Sometimes this is a normal marine assemblage, but often it is abnormal. In Potter County, in comparatively young, non-red strata pelecypods are associated with plant and eurypterid remains. Near Mansfield, Tioga County, fish plates and inarticulate brachiopods were collected from the same red horizon. Farther east, in Bradford County, characteristic, marine Chemung fossils were found with fish remains and fragmentary plants in red rocks. *Spirifer disjunctus* Sowerby is not universally present. It is noticeably absent from the lower Chemung along the axis of the Sabinsville anticline; but, conversely, runs well up into the red beds generally, even after most of the other marine forms may have vanished. Thus, in Bradford County, this fossil occurs in red strata with only a remnant of the many species with which it was earlier associated. But, although it existed in water in which red beds were forming, the species fails to show here the dwarfing which it underwent in the First District under apparently like conditions.

FOURTH DISTRICT. Here the members of the Devonian are much as in the Second District, being: fresh-water Chemung, Portage (Ithaca), Hamilton, Marcellus, Onodaga, Schoharie (?), Esopus, Oriskany, and Helderberg. Faunules have been quoted from the Marcellus, Hamilton and Portage members. The first is probably unique in Pennsylvania through being a large number of species from a member normally barren or nearly so. The most striking feature of the Hamilton is the great "reef" assemblage. As with modern, tropical reefs, corals, though common, are not the only organisms present. Probably the bryozoans have had nearly as much to do with reef-building here as the corals, and the many other animals present speak of a characteristic reef facies swarming with a multitude of varied sea-dwellers. Prosser observed the absence of marine Chemung in Pike and Monroe counties. It remains merely to call attention to the similar conditions in the Second District, although marine Chemung is known in the First and Fourth. Possibly continental deposits encroached upon the Second District simultaneously with their appearance in the Fourth. It is anticipated that further study of the region between the First, Second and Fourth districts may solve this question.

SYNOPSIS OF DEVONIAN MEMBERS BY DISTRICTS

FIRST DISTRICT		SECOND DISTRICT		THIRD DISTRICT		FOURTH DISTRICT	
Chemung	Non-marine ("Catskill") Marine	Chemung	Non-marine ("Catskill")	Chemung	Non-marine, part or all of Cattaraugus Marine	Chemung	Non-marine ("Catskill")
Portage	Parkhead Ithaca Sherburne ?	Portage	Ithaca Sherburne Nunda ?	Portage ?, Enfield ?		Portage, Ithaca	
Genesee		Genesee					
		Tully ?					
Hamilton		Hamilton				Hamilton	
Marcellus		Marcellus				Marcellus	
Onondaga		Onondaga				Onondaga	
						Schoharie ?	
		Esopus				Esopus	
Oriskany	Ridgely Shriver	Oriskany	Ridgely Shriver			Oriskany	
Helderberg		Helderberg				Helderberg	